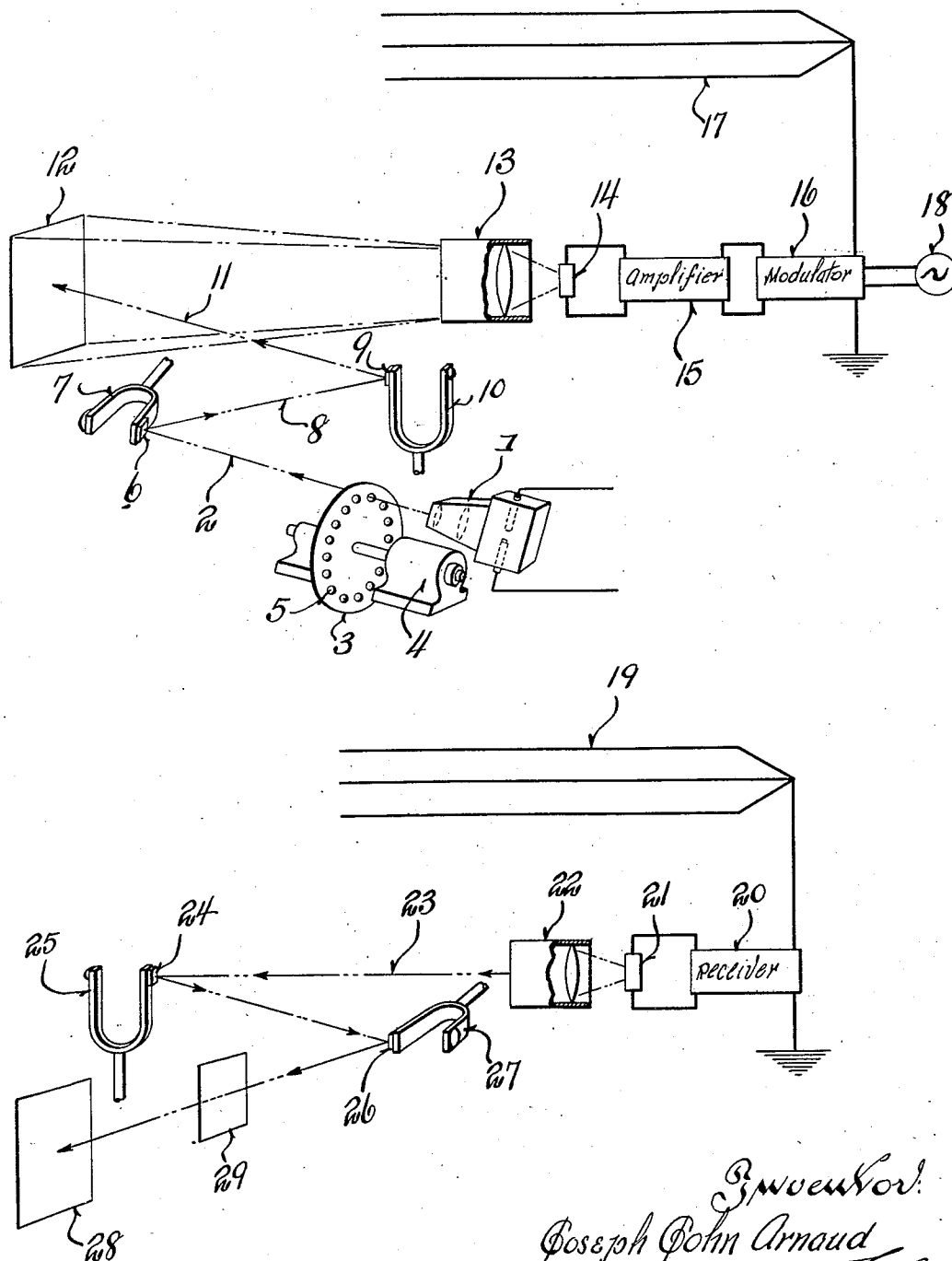


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TELEVISION APPARATUS

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UNITED STATES PATENT OFFICE

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TELEVISION APPARATUS

Application filed February 17, 1928. Serial No. 255,042.

This invention relates to television apparatus.

Objects of this invention are to provide a television apparatus in which pictures may be sent by wireless means or by wire means from one station to another so that a complete picture is formed in a fraction of a second, thus permitting the sending of moving pictures by wireless means or by wire means from one station to another station.

Further objects are to provide a television apparatus in which reliable and simple means are employed for causing a searching ray to travel over the entire surface of the object or picture, and in which the receiving means is equipped with a similar device for causing the projected ray to travel over the entire screen, with means for controlling the intensity of illumination at the receiving station in exact proportion to the light and shadow at the sending station so that an exact reproduction occurs.

Further objects are to provide a television apparatus having the characteristics noted above which is of very simple construction and which may be relatively easily operated.

An embodiment of the invention is shown in the accompanying drawings in which:

The single figure is a diagrammatic view showing the television apparatus both at the sending and receiving end.

Referring to the drawing, it will be seen that a projecting lantern 1 is provided for furnishing a single beam of light which, in reality, constitutes almost a point or thin pencil of light. This ray of light as it passes from the lamp is indicated by the reference character 2, and it will be seen that the ray may be intercepted at regular and rapid intervals by means of the rotating disc 3 driven in any suitable manner, as by means of the motor 4. The disc 3 is provided with a plurality of apertures 5 through which the ray of light passes, so that the light is cut off and turned on at regular intervals to provide sharp pulses of light.

The ray of light is received by means of a small mirror 6 attached to a tuning fork 7 which is approximately horizontal in position. The ray of light is reflected from the

mirror 6 along the path 8 and falls upon the mirror 9 carried by a vertical tuning fork 10. From this point, the ray of light passes along the path 11 upon the picture or object such, for example, as the face of a person, as indicated by the reference character 12.

From the apparatus thus far described, it is evident that, as the tuning forks vibrate, the fork 7 will cause the ray to travel horizontally across the screen or object and the fork 10 will cause the ray to travel vertically across the screen or object. If the forks have periods which bear a definite relation to each other as 1 to 1, 1 to 2, 1 to 3, etc., the well known Lissajous curves will be formed. However, this result is not desired for there would be portions of the screen which would not be illuminated. Instead, in this invention, the periods of the forks are so related that the ray will pass over and illuminate successively all portions of the screen.

Theoretically, this last result may be secured by making the periods of forks incommensurate so that regular Lissajous figures will not be formed but instead the ray, as stated, will pass over every portion of the screen. Practically, if the periods are not incommensurate, but bear to each other some ratio not too simple, then the curve will be reentrant. That is, it will trace out a line closed on itself and will then retrace and retrace this same line indefinitely. All that is necessary is that the adjacent lines of the figure shall be close enough to blend into a continuous picture. The number of vibrations of the forks per second will determine the number of trips over the screen that the spot of light or ray of light will execute per second. The most suitable ratio of the periods of the forks can best be obtained by trial. If desired, one or both of the forks may be provided with a sliding weight so that the period can be adjusted.

The light reflected from the screen or object is condensed by means of the optical apparatus 13 provided with condensing lens and falls upon a photoelectric cell 14 which may be a selenium or other light sensitive cell. The cell controls an amplifier 15 which may be of the vacuum tube type and such am-

plifier in turn controls a modulator 16 and thus modulates the high frequency energy passing to the antenna 17, such high frequency energy being supplied by means of the oscillator 18 in a well known manner.

From the apparatus thus far described, it is evident that the wireless waves radiating from the antenna 17 will be in exact accordance with the shadow or light effect of the object or screen at the particular point illuminated by the travelling or searching ray, and that these wireless waves will vary continuously as to amplitude or energy transmitted as the searching ray passes from one colored or shadowed portion to a different portion of the object or screen.

The receiving apparatus consists of an antenna 19 connected to a receiver 20 which amplifies the received waves and controls a neon or other light producing tube 21, which has a substantially instantaneous response to the electric energy supplied.

In this way the tube 21 will be illuminated more or less in exact proportion to the strength of the wireless waves received and consequently in exact accordance with the brightness or darkness of the portion of the object or screen over which the searching ray 11 is passing at the sending end.

The light from the tube 21 is picked up by the optical apparatus 22 provided with condensing lenses and producing a substantially cylindrical tiny beam of light 23. This beam of light 23 is received by a mirror 24 carried by a vertical tuning fork 25. It is reflected and falls upon a mirror 26 carried by the horizontal tuning fork 27. From this point, the ray of light passes to the receiving screen 28. If desired, it may pass through a plate 29 formed in a manner hereinafter described. It is evident that the vertical tuning fork 25 must have the same period of vibration as the vertical tuning fork 10, and that the horizontal tuning fork 27 must have the same period of vibration as the horizontal tuning fork 7. Any suitable means may be employed for keeping the tuning forks in operation and in synchronism, such for example, as the electromagnetic actuating means commonly known.

It is to be noted that the ray of light projected upon the screen 28 will move in exact accordance with the searching ray 11 and will consequently fall upon the same portion of the screen as the searching ray at all positions of the searching ray. Inasmuch as the intensity of the projected beam 23 varies in exact accordance with the amount of light received by the photoelectric cell 14, it is apparent that the ray will be alternately illuminated in exact step with the brilliancy of the light reflected from the particular portion of the object or screen illuminated by the searching ray at any given instant.

It is also to be noted that, inasmuch as the

tuning forks have simple harmonic motions, the outer edge of the screen will have the light upon it for the greatest length of time. This may be readily corrected by providing the plate 29 which has a greater density at its margins than at its center so far as the passage of light is concerned. This plate may be produced by using a photographic plate and having a beam of constant intensity thrown thereon by the vibrating forks and thereafter the plate may be developed. It clearly will be densest where the light has remained for the greatest length of time and therefore will exactly temper or proportion the lighting of the screen 28 so as to insure a picture of uniform density throughout.

While the member 29 is referred to as a plate or photographic plate, it is to be understood that such expression is not intended as limiting as a film or other photographic member may be employed provided it has the characteristics noted above.

It is to be noted that the rotating disc 3 provides sharp pulses of light which produces in the reproduced figure the effect of a half tone. In addition to this, it has been found that the light sensitive cell 14, if it has any lag whatsoever, will be more effective in reproducing the exact proportionate degree of current if it is illuminated by sharp pulses of light which seem to eliminate the effect of the time lag of the cell. It is, of course, to be understood that the rotating disc may be omitted in certain forms of the apparatus. The use of a neon lamp or tube 21 is desirable although other tubes may be used, because the neon tube gives a substantially instantaneous response to the electric current.

Further than this, it is clear also that a battery of photoelectric cells could be employed in place of the single photoelectric cell illustrated by the transmitting portion of the apparatus.

It is apparent that the tuning fork system can also be used to single out one spot of a constantly illuminated field. For example, the apparatus consisting of the elements 13 to 18, could be substituted for the light projecting apparatus and associated with the tuning forks and mirrors to cause the modulating apparatus to single out a single, travelling point in a uniformly illuminated field. In this manner, it would not be necessary to use a dark room for the object to be illuminated, but instead, the illumination could be constant and the modulating or light responsive apparatus could, as stated, single out a single point from the object and in this way transmit the modulated waves, the light responsive apparatus being shielded from all light except that supplied from the travelling point.

While the member 12 has been shown as a screen for the purpose of illustration, it is to be distinctly understood that the member

12 may be replaced by any object whose picture it is desired to transmit. For example, a person or face may be substituted for the screen 12, or pictures themselves may be used.

5 In all cases, the reproduced pictures will be an exact reproduction of the object over which the searching ray passes.

Other forms of light guiding means may be employed. For example, a mirror may be carried by a T-shaped bar, the mirror being placed at the point of union of the shank or stem with the cross member of the bar, and in the plane of the T. The shank may be resilient and the transverse portion of the T-shaped member may be operated by means of a plurality of electromagnets controlled in any suitable manner; for example, by means of vacuum tubes, so as to give the mirror motion about two distinct axes at right angles to each other.

It is evident that the invention lends itself admirably to the conventional wireless transmitting practices.

It will be seen further that the device, although accomplishing the objects enumerated above, is extremely simple in construction and is highly practical.

Although the invention has been described in considerable detail, such description is intended as illustrative rather than limiting as the invention may be variously embodied and as the scope of such invention is to be determined as claimed.

I claim:

35 1. The method of preparing an equalizing screen for a searching ray, which traverses a projection screen according to a rule that obliges it to remain longer directed to some portions of the screen than to others, or traces lines more congested in some portions of the projection screen than in others; said method consisting in: causing this ray to traverse a photographic plate according to said rule; and then developing said plate.

45 2. The method of making an equalizing screen for a television apparatus in which a moving ray is employed, said method comprising placing a photographic plate in the path of said ray, causing said ray to traverse said plate, and subsequently developing said plate.

55 3. An equalizing screen comprising a photographic plate having different degrees of density from point to point throughout its extent produced by exposing different portions of the screen to different degrees.

4. An equalizing screen comprising a photographic plate having different degrees of exposure throughout its extent to produce different degrees of density according to a predetermined rule.

65 5. In a television apparatus, the combination of: a source of light; means for projecting a ray of light from said source and moving said ray in accordance with a pre-

determined rule; and an equalizing screen through which said ray passes, said screen consisting of a photographic plate having its density varying in accordance with said rule.

6. In a television apparatus, the combination of: a source of light; means for projecting a ray of light from said source and moving said ray in accordance with a predetermined rule; and an equalizing screen through which said ray passes, said screen consisting of a photographic plate having different degrees of density produced by different degrees of exposure varying in accordance with said rule.

In testimony that I claim the foregoing I have hereunto set my hand at South Milwaukee, in the county of Milwaukee and State of Wisconsin.

JOSEPH JOHN ARNAUD.